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Sekino et al.

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(54) **CONNECTOR**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**

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H01R 13/502	(2006.01)
H01R 13/62	(2006.01)
H01R 24/28	(2011.01)
H01R 13/641	(2006.01)
H01R 13/627	(2006.01)
H01R 13/639	(2006.01)
H01R 103/00	(2006.01)

(52) **U.S. Cl.**

CPC ***H01R 13/4368*** (2013.01); ***H01R 13/502*** (2013.01); ***H01R 13/62*** (2013.01); ***H01R 13/6271*** (2013.01); ***H01R 13/639*** (2013.01); ***H01R 13/641*** (2013.01); ***H01R 24/28*** (2013.01); *H01R 2103/00* (2013.01)

(58) **Field of Classification Search**

CPC .. H01R 13/4368; H01R 13/502; H01R 13/62; H01R 13/6271; H01R 13/641; H01R 24/28; H01R 2103/00; H01R 13/639

USPC 439/368, 299, 350, 352, 357, 358

See application file for complete search history.

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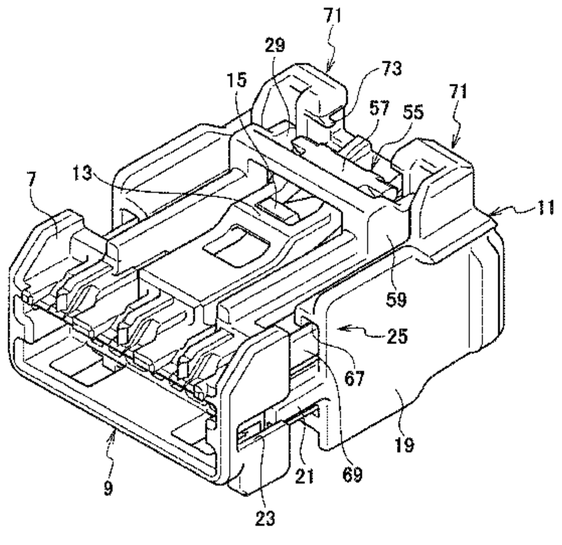
(57) **ABSTRACT**

A connector includes a first housing having a first fitting part, a second housing having a second fitting part configured so as to be fittable to the first fitting part, a fitting detection member assembled to an outer circumference of the second housing so as to be movable between a temporary locking position and a primary locking position, an engaged part provided on the second fitting part, and an engaging part which is provided on the fitting detection member so as to be abuttable on the first fitting part and also engaged to the engaged part to hold the fitting detection member at the temporary locking position and the primary locking position to the second housing. The second fitting part and the engaging part are accommodated in the first fitting part.

6 Claims, 17 Drawing Sheets



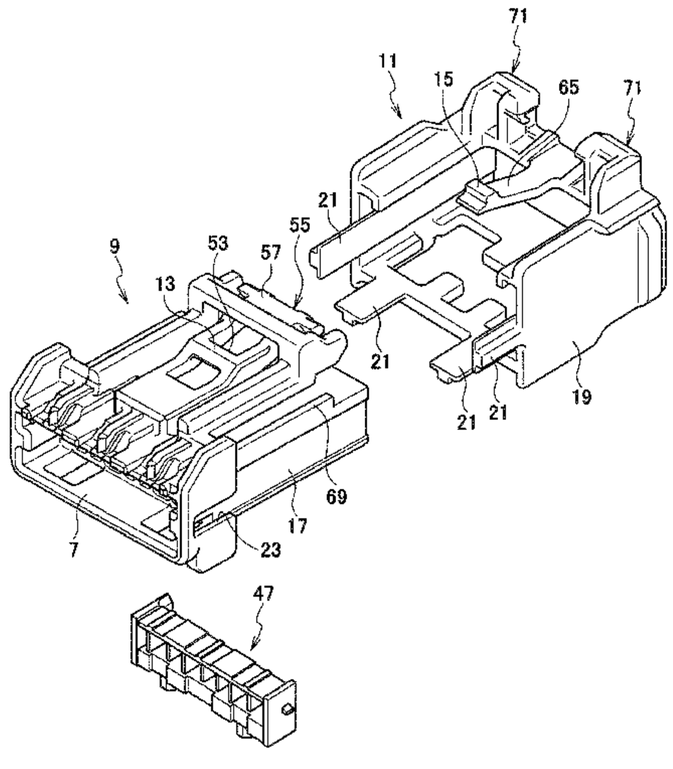


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FIG. 1

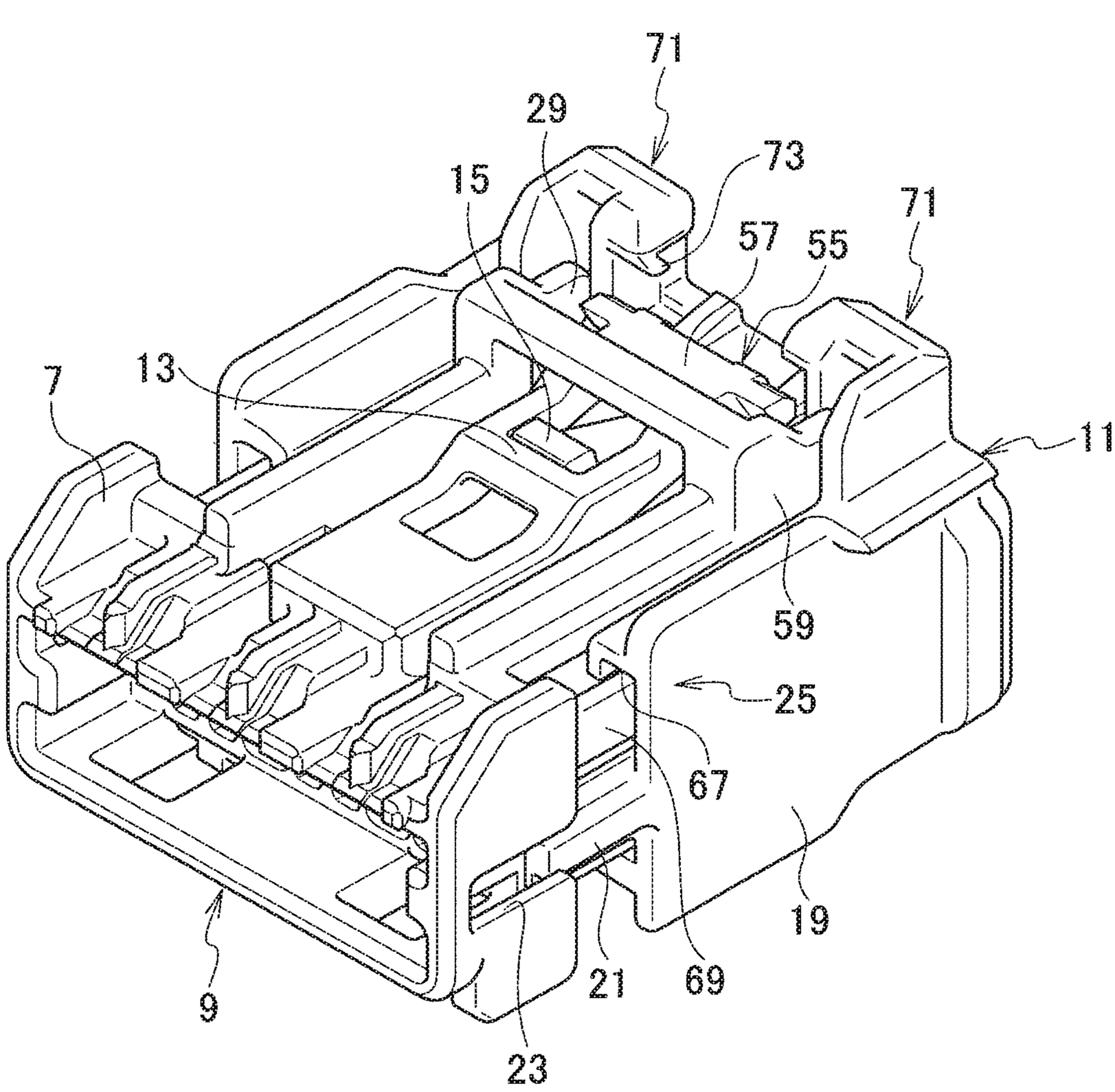


FIG. 2

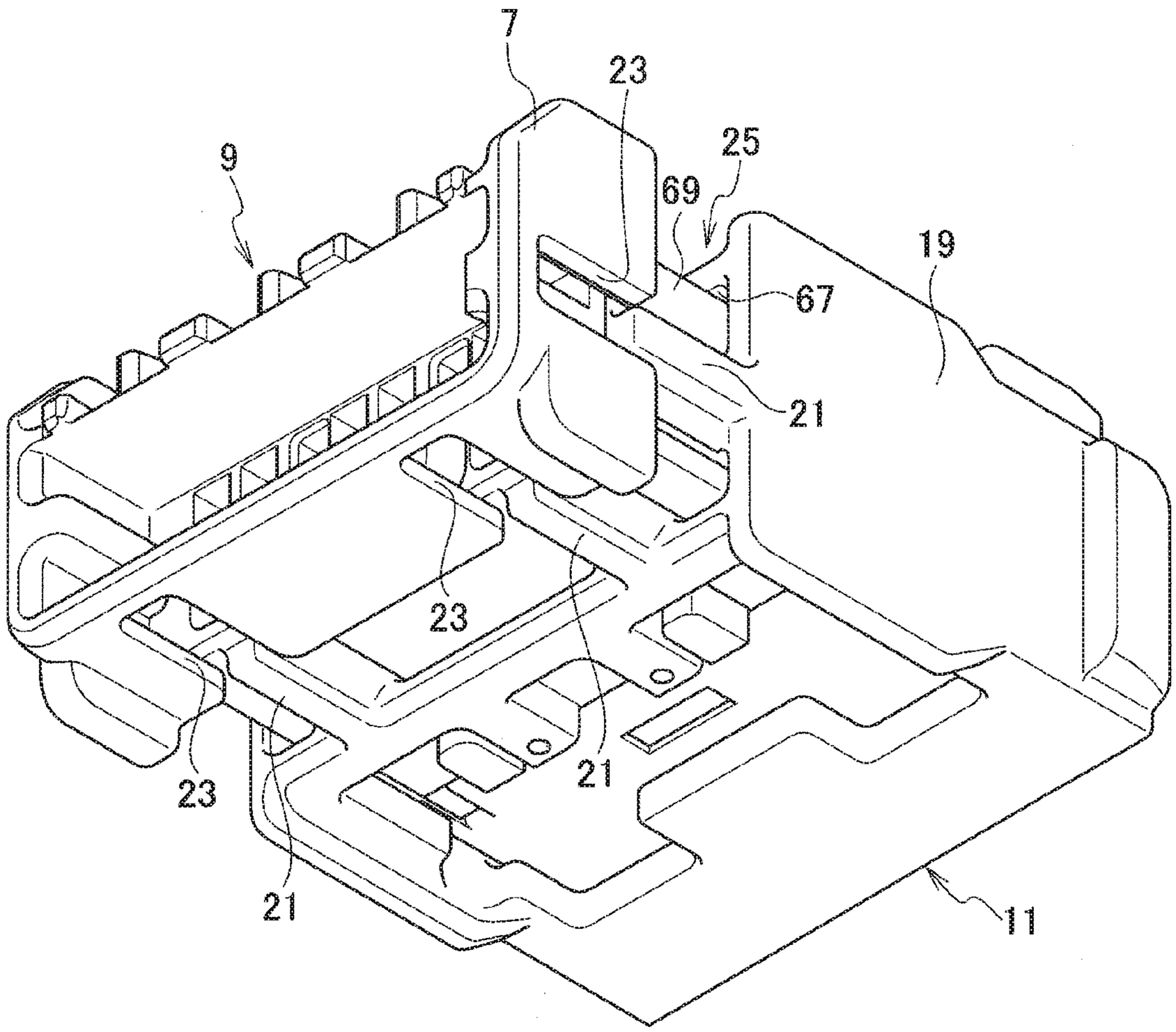


FIG. 3

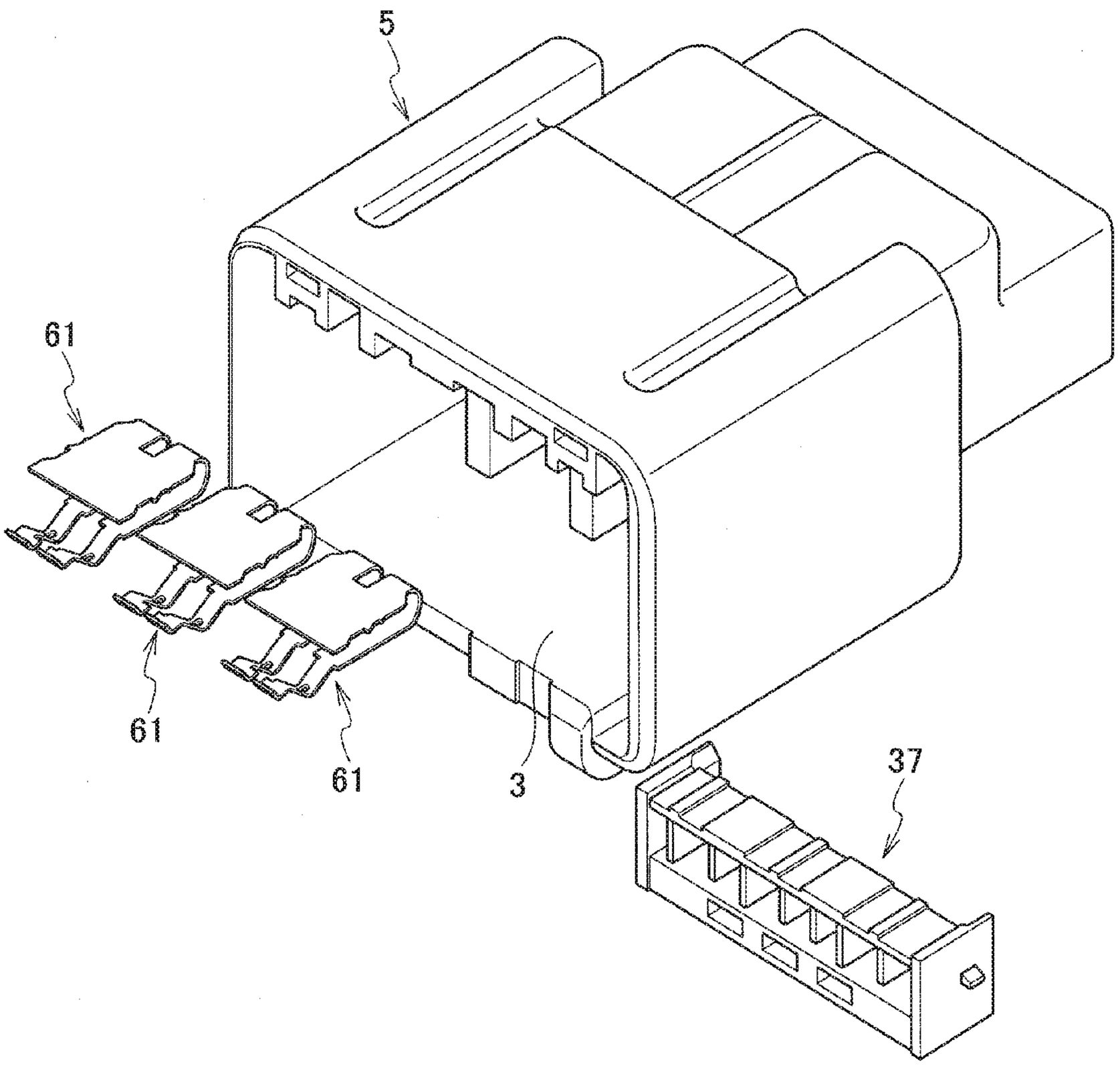


FIG. 4

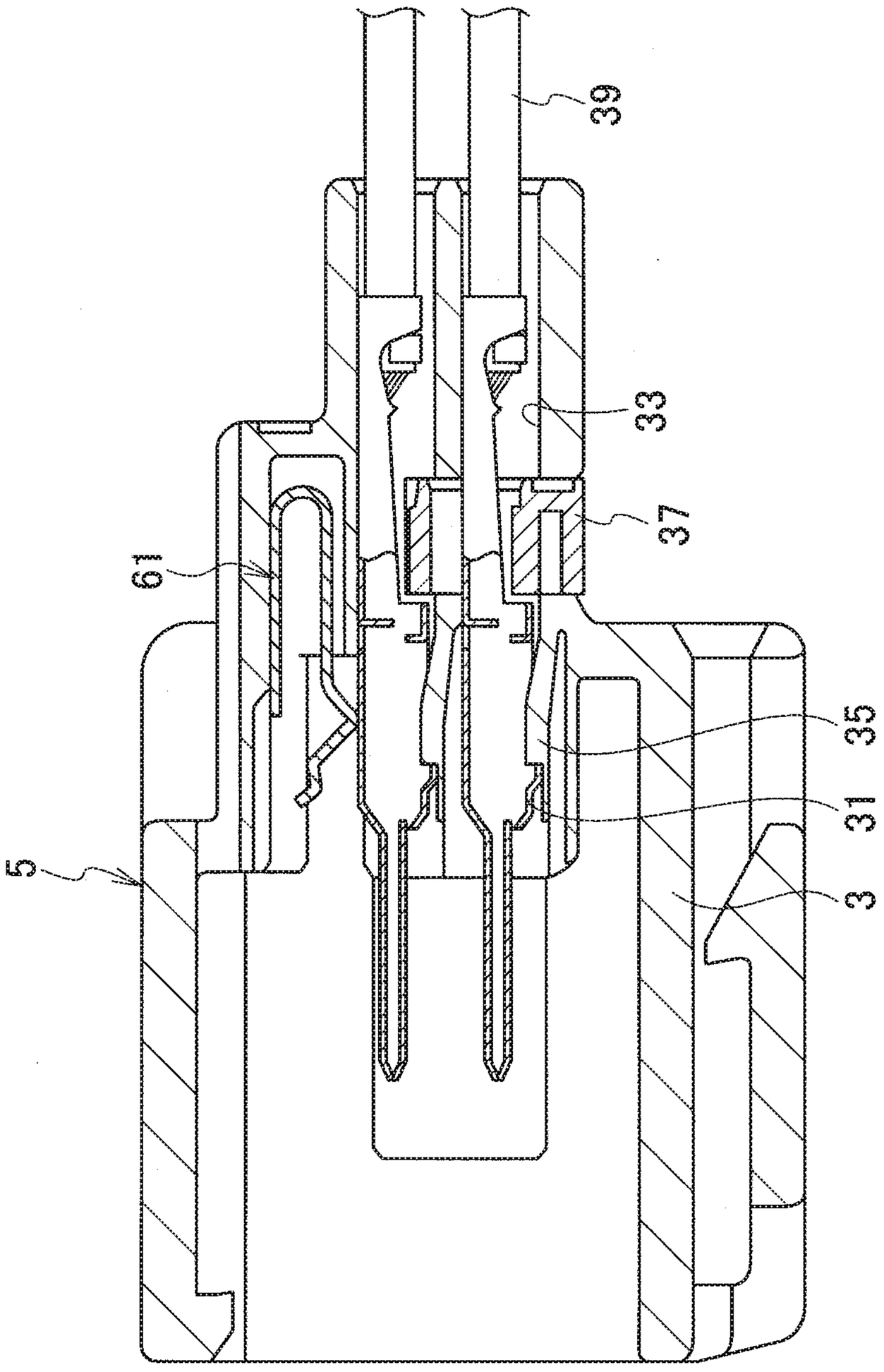


FIG. 5

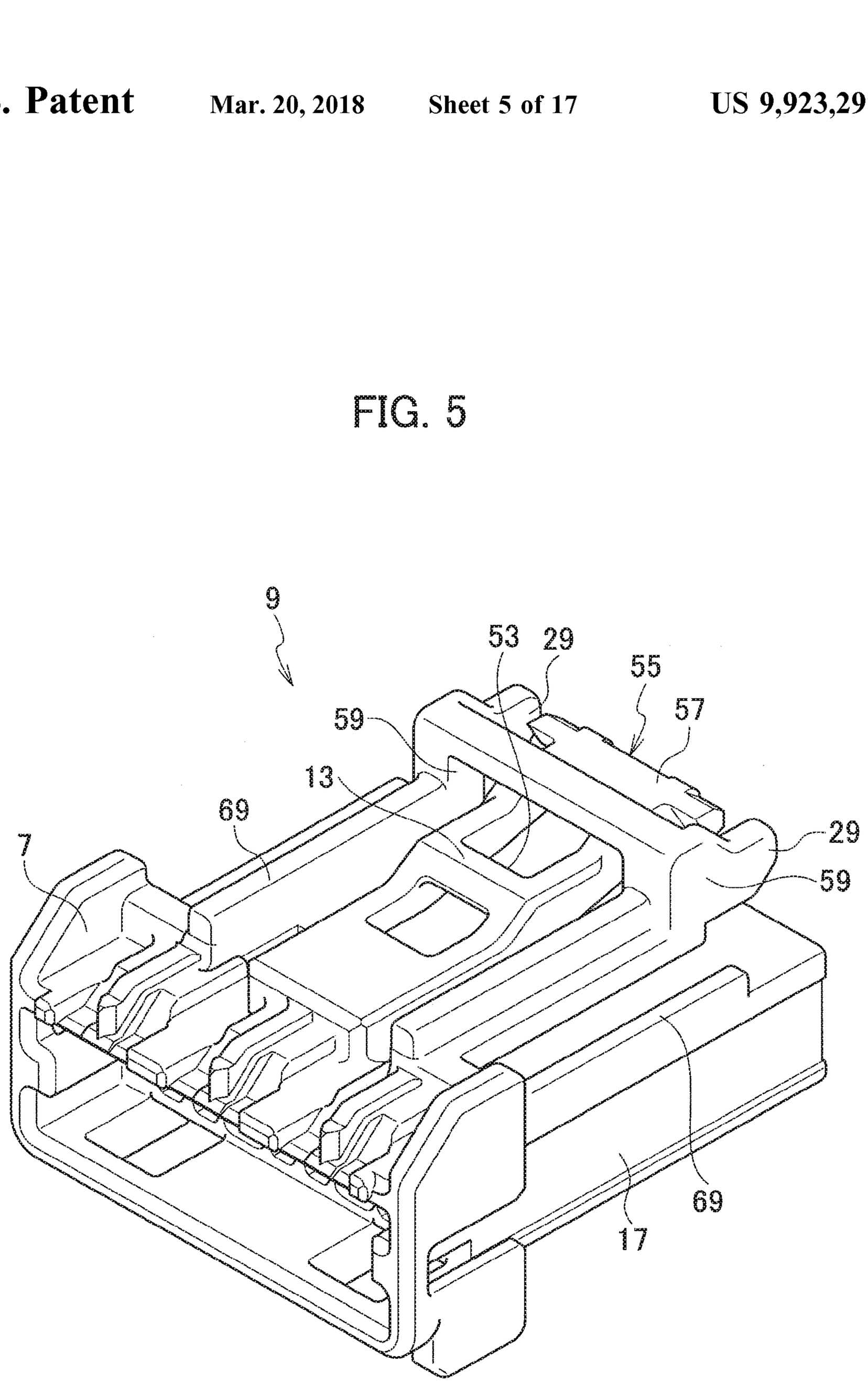


FIG. 6

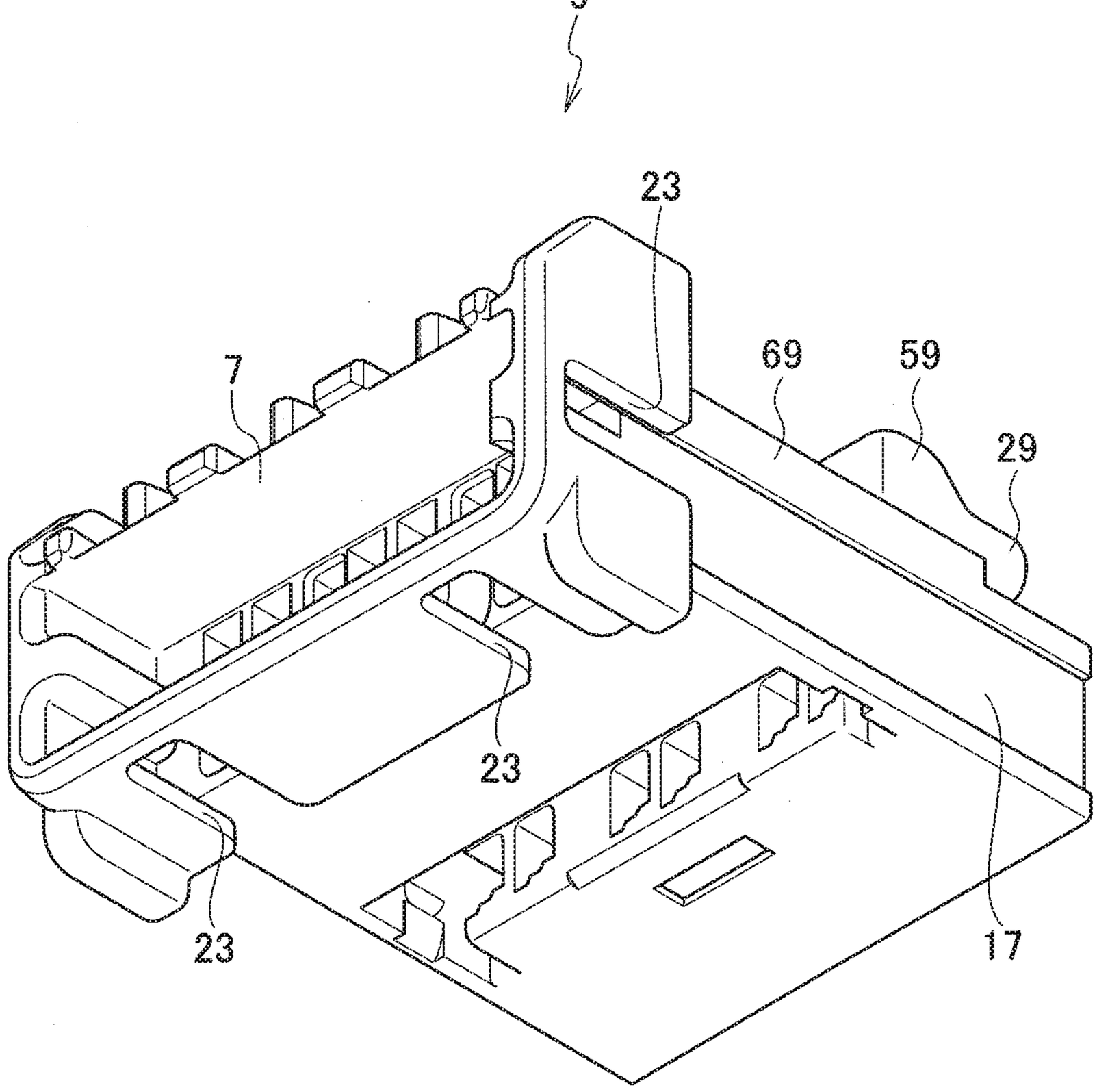


FIG. 7

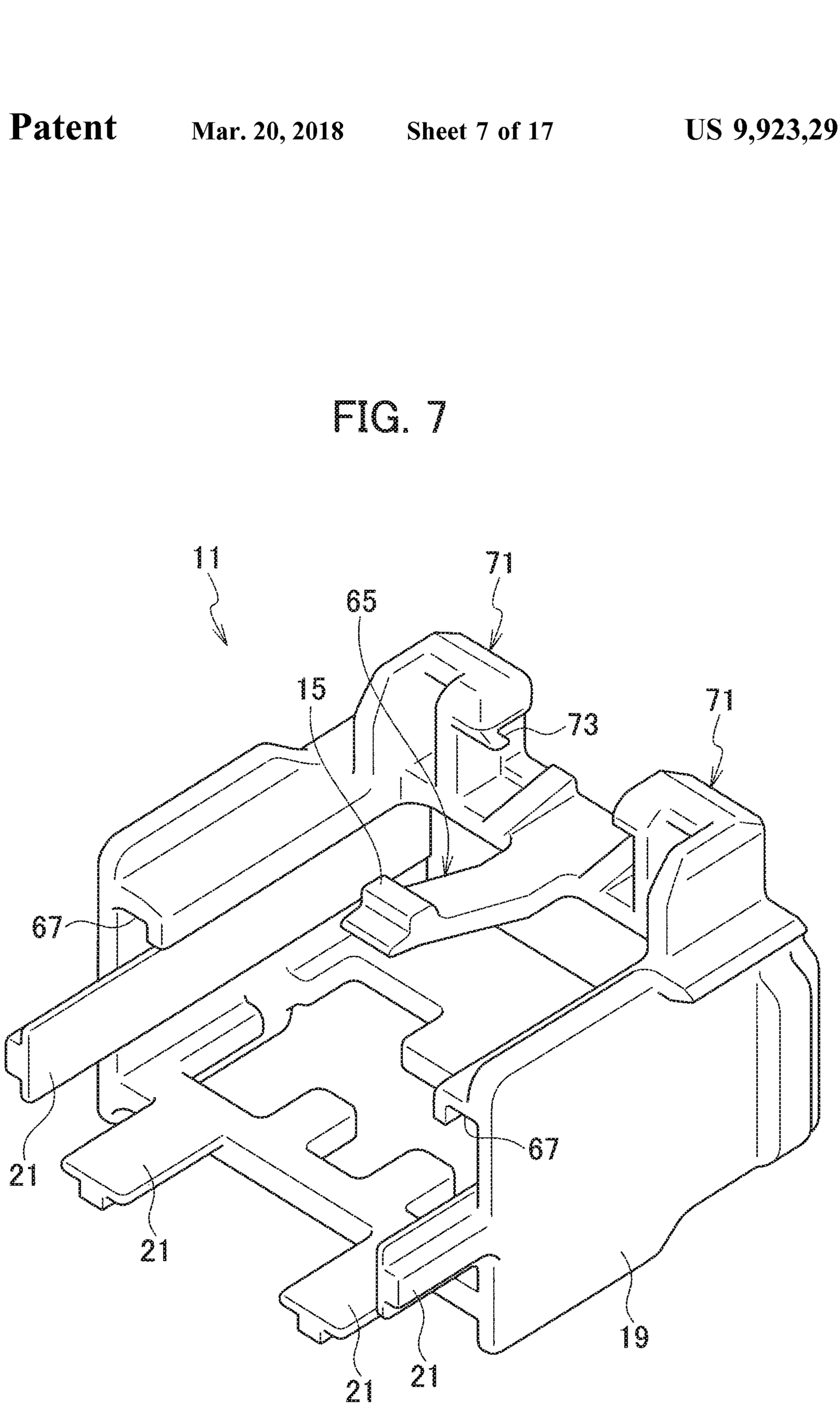


FIG. 8

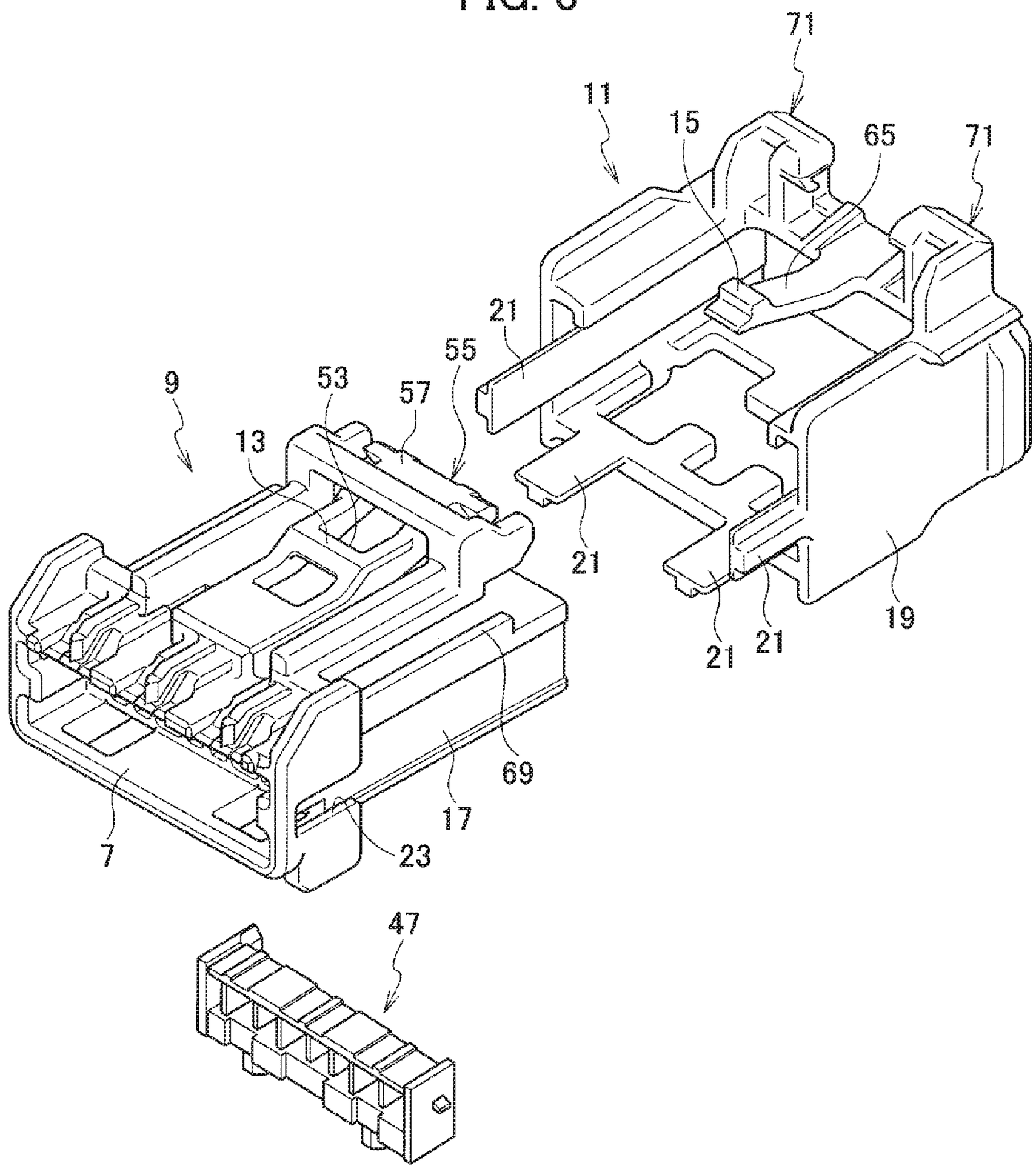


FIG. 9

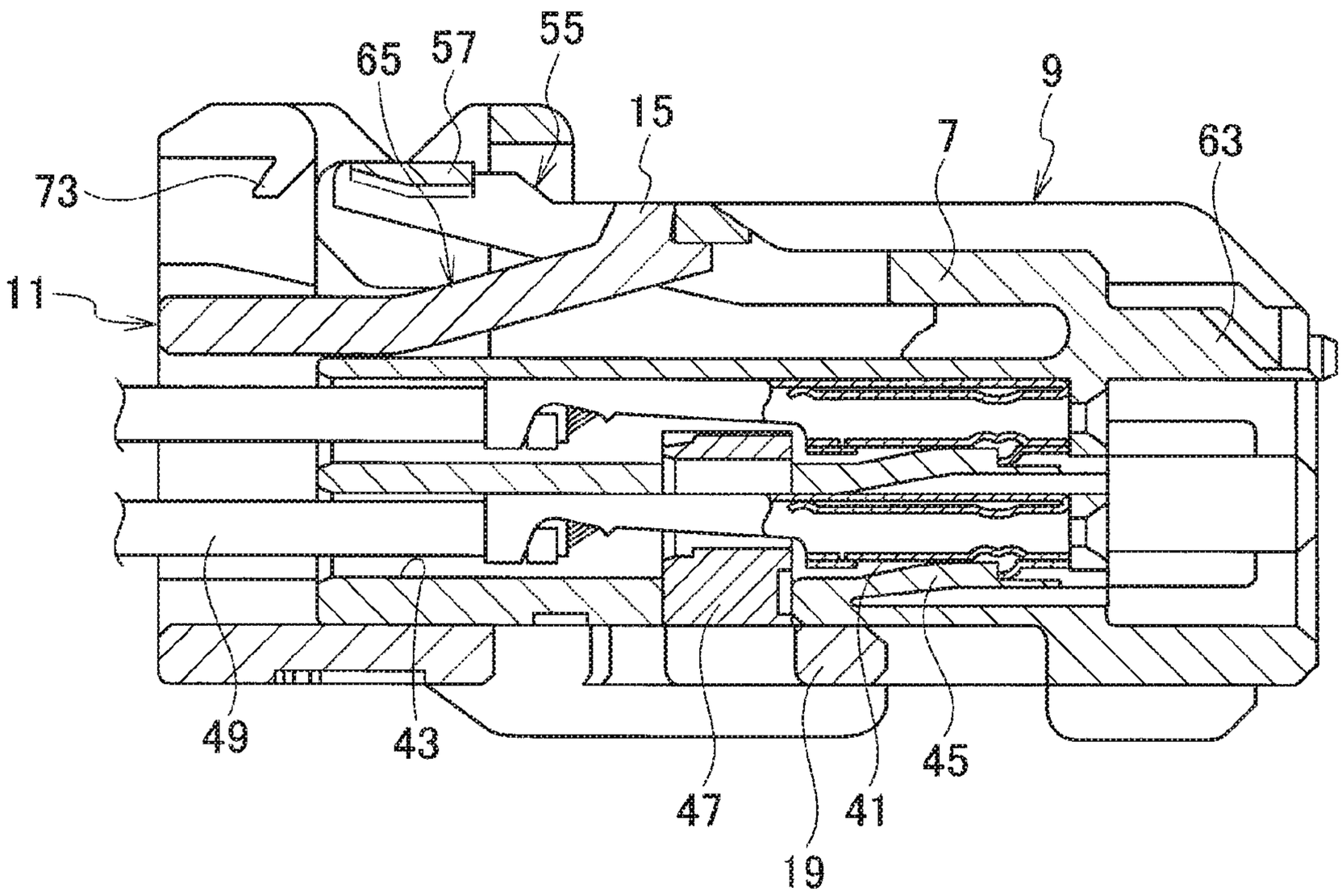


FIG. 10

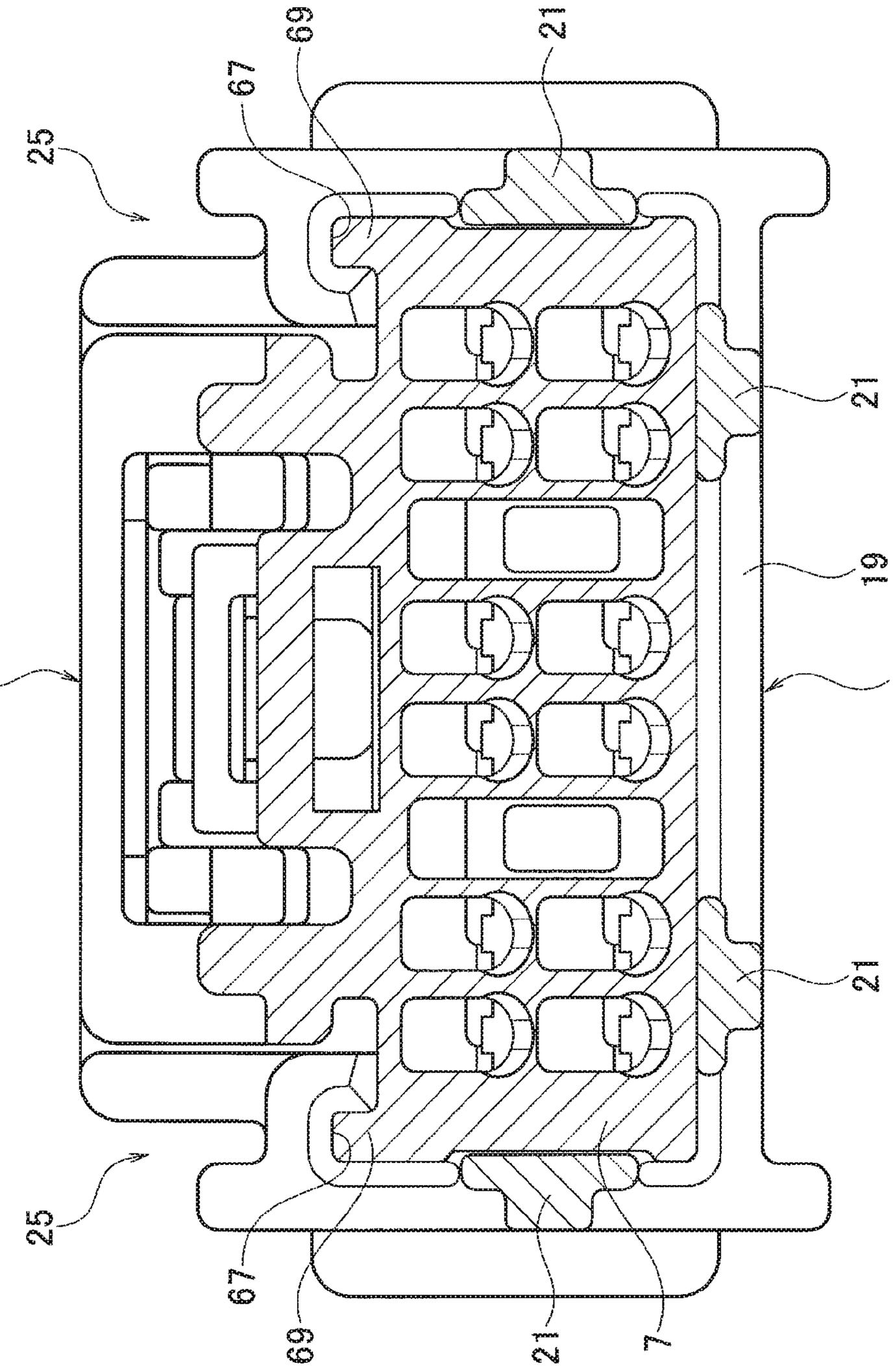


FIG. 11

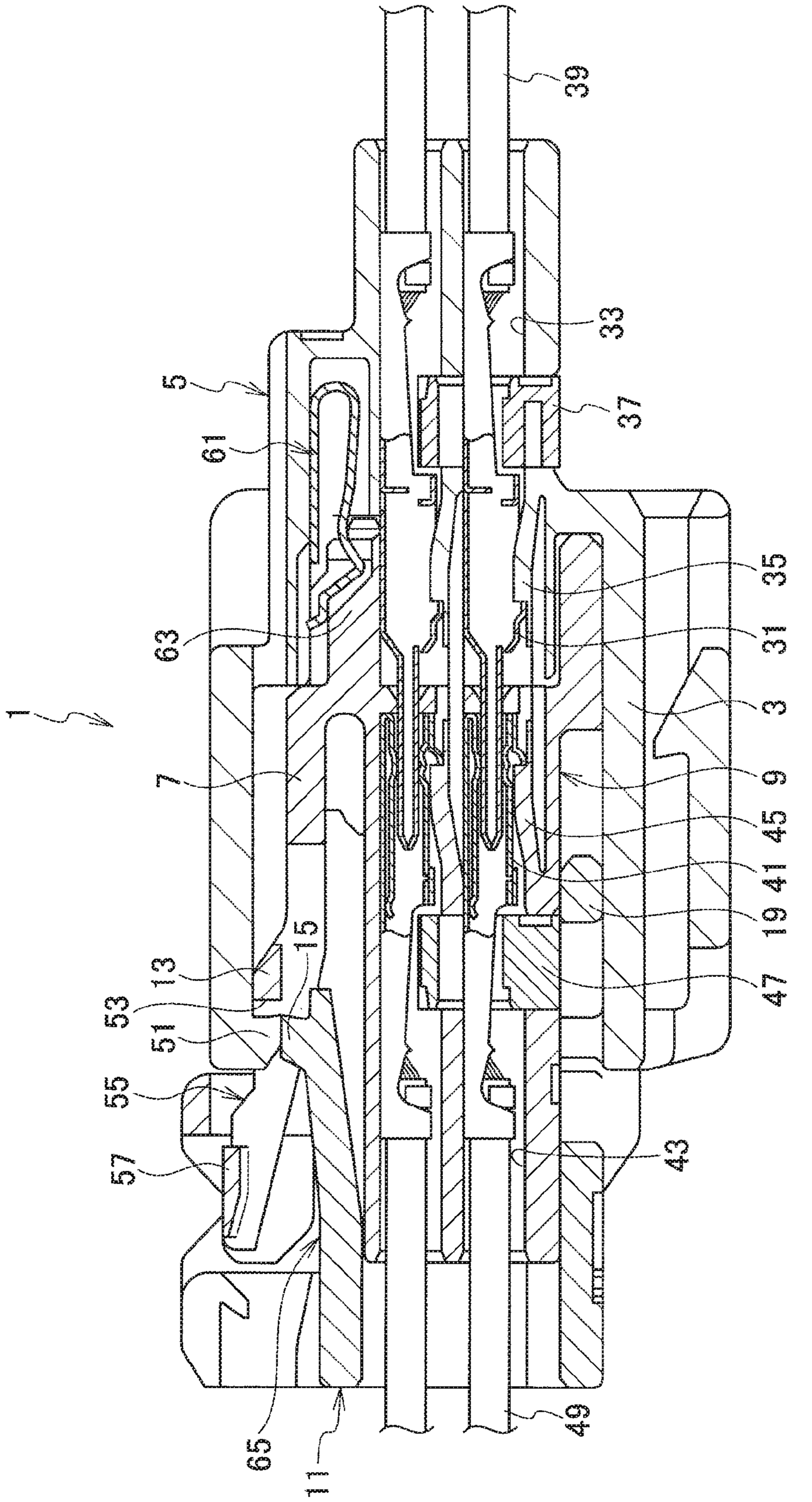


FIG. 12

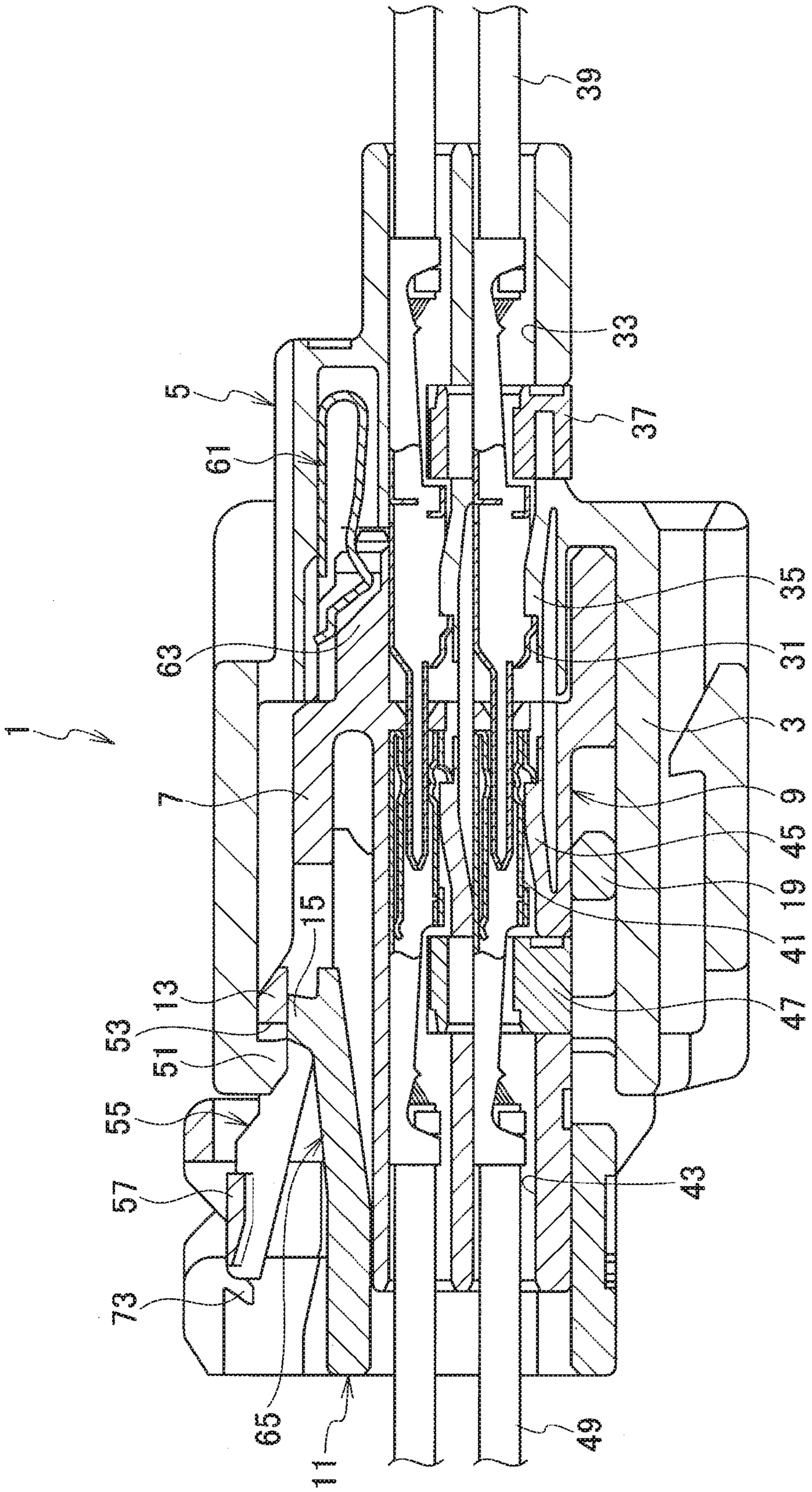


FIG. 13

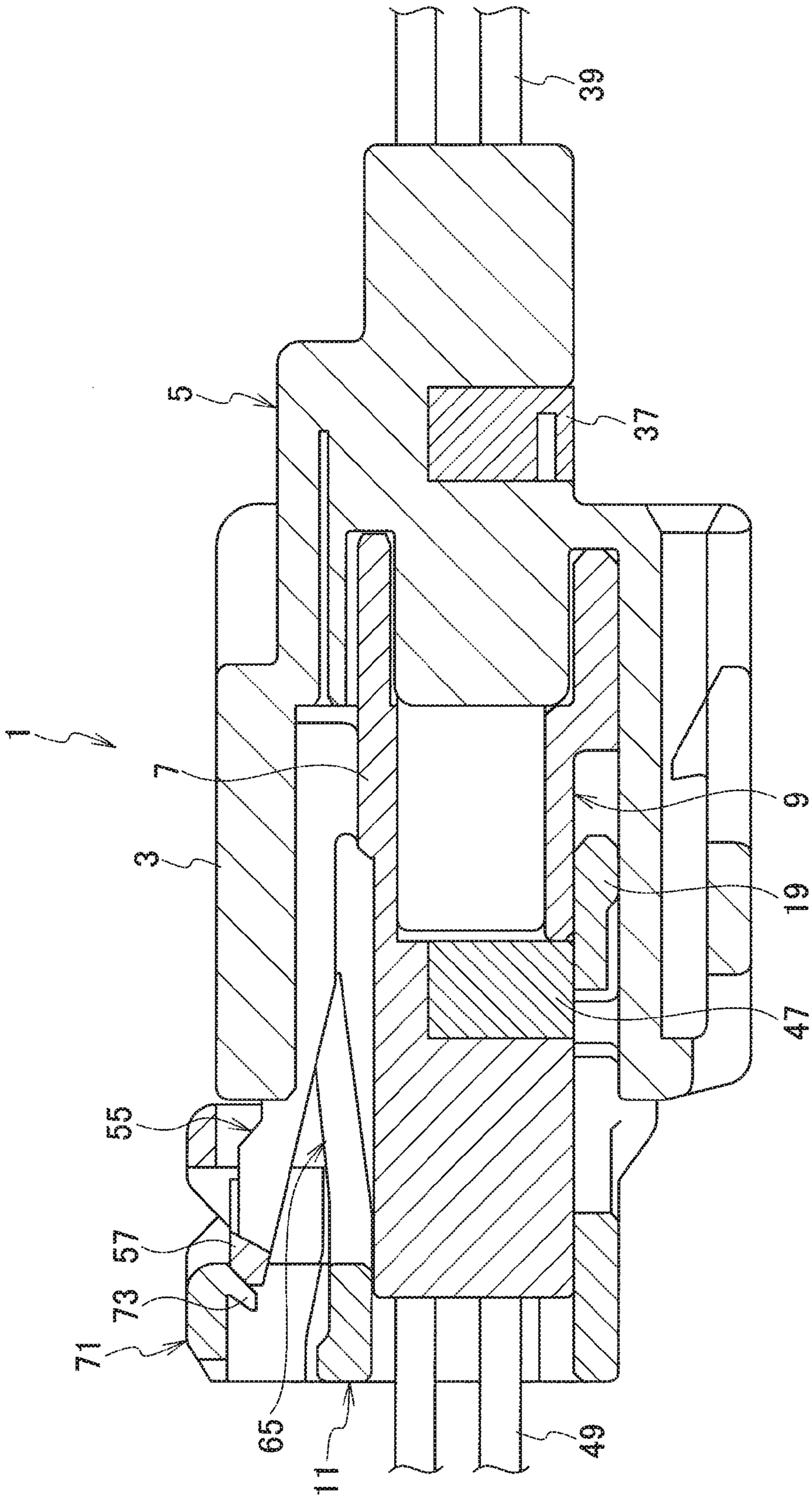


FIG. 14

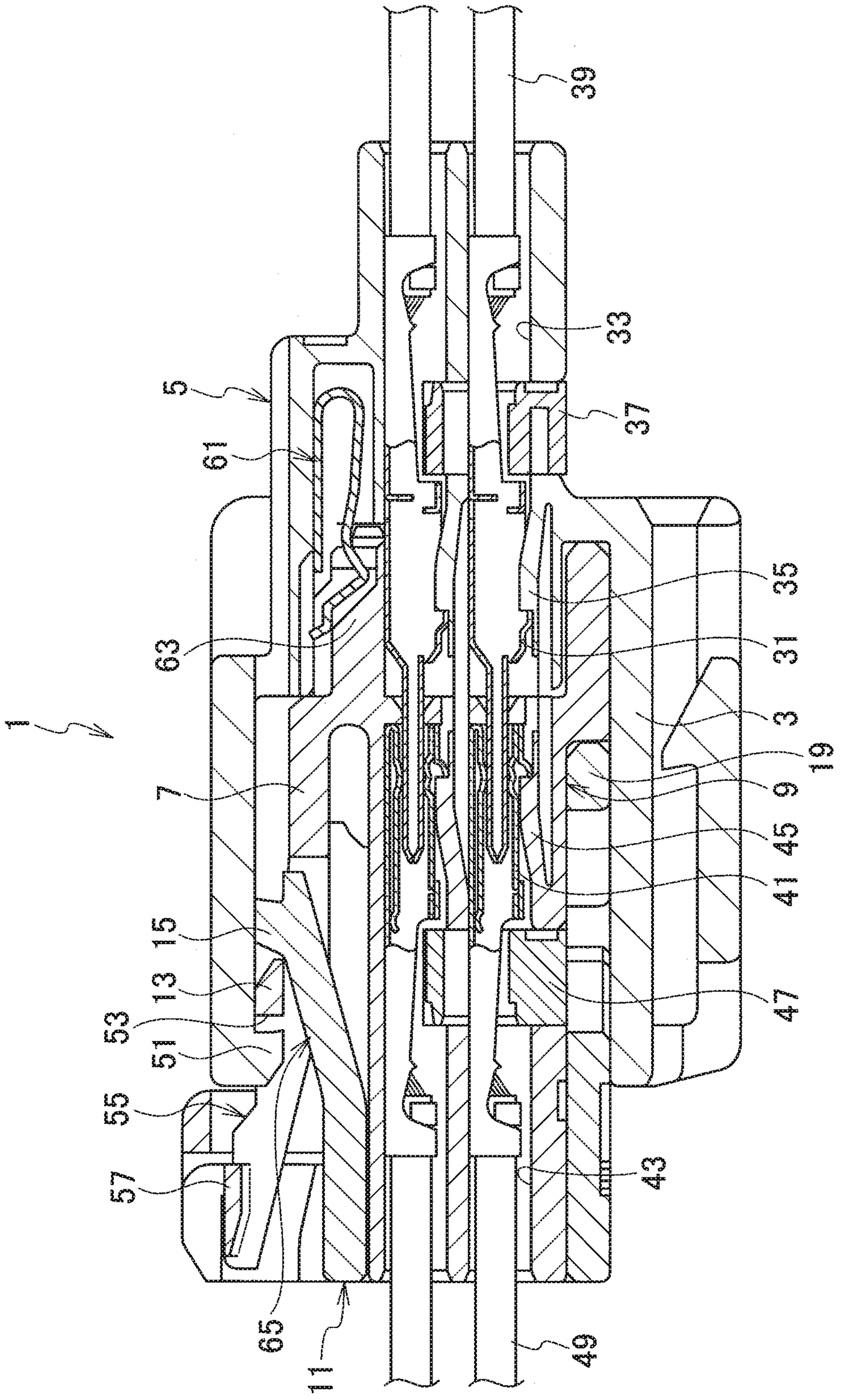


FIG. 15

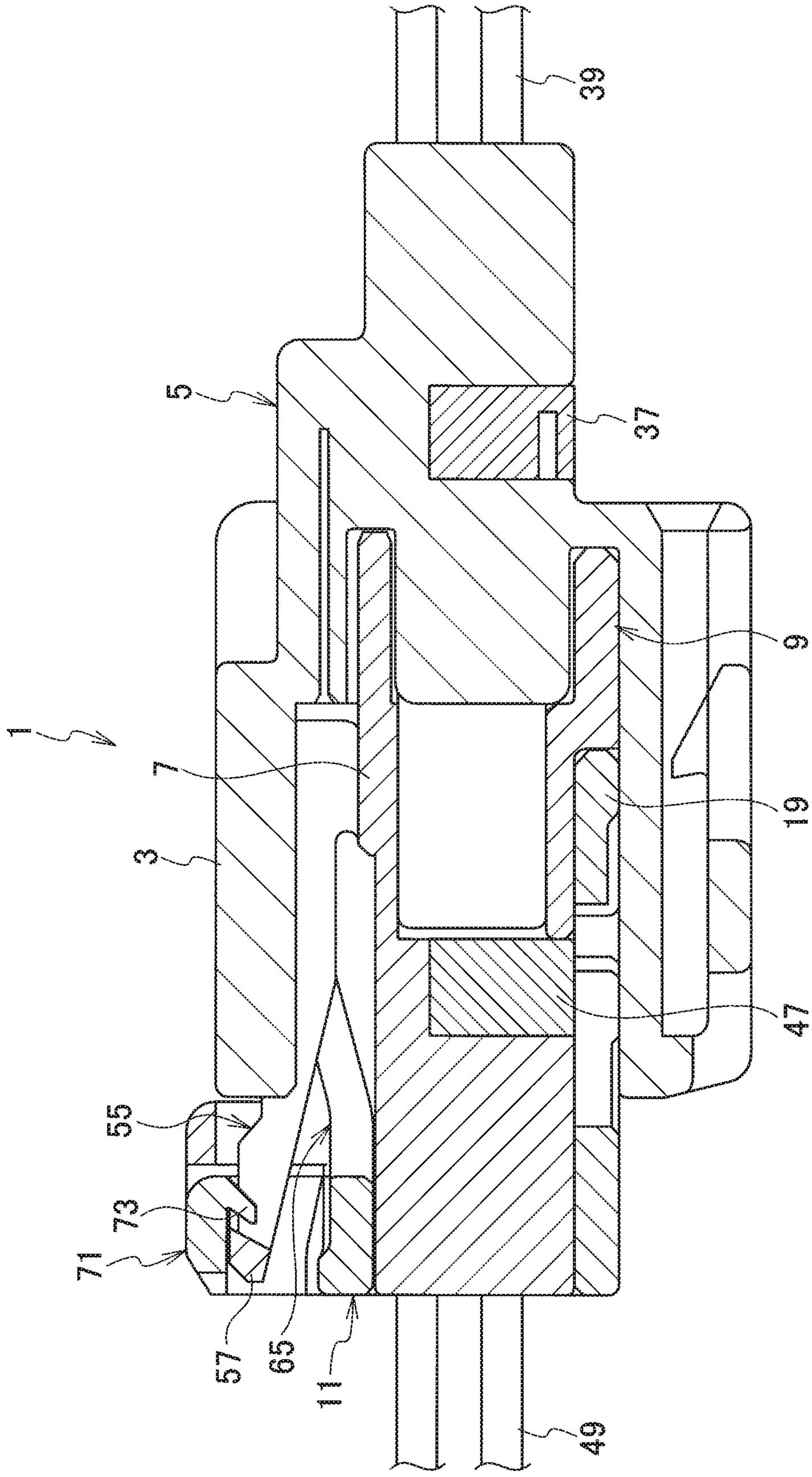


FIG. 16

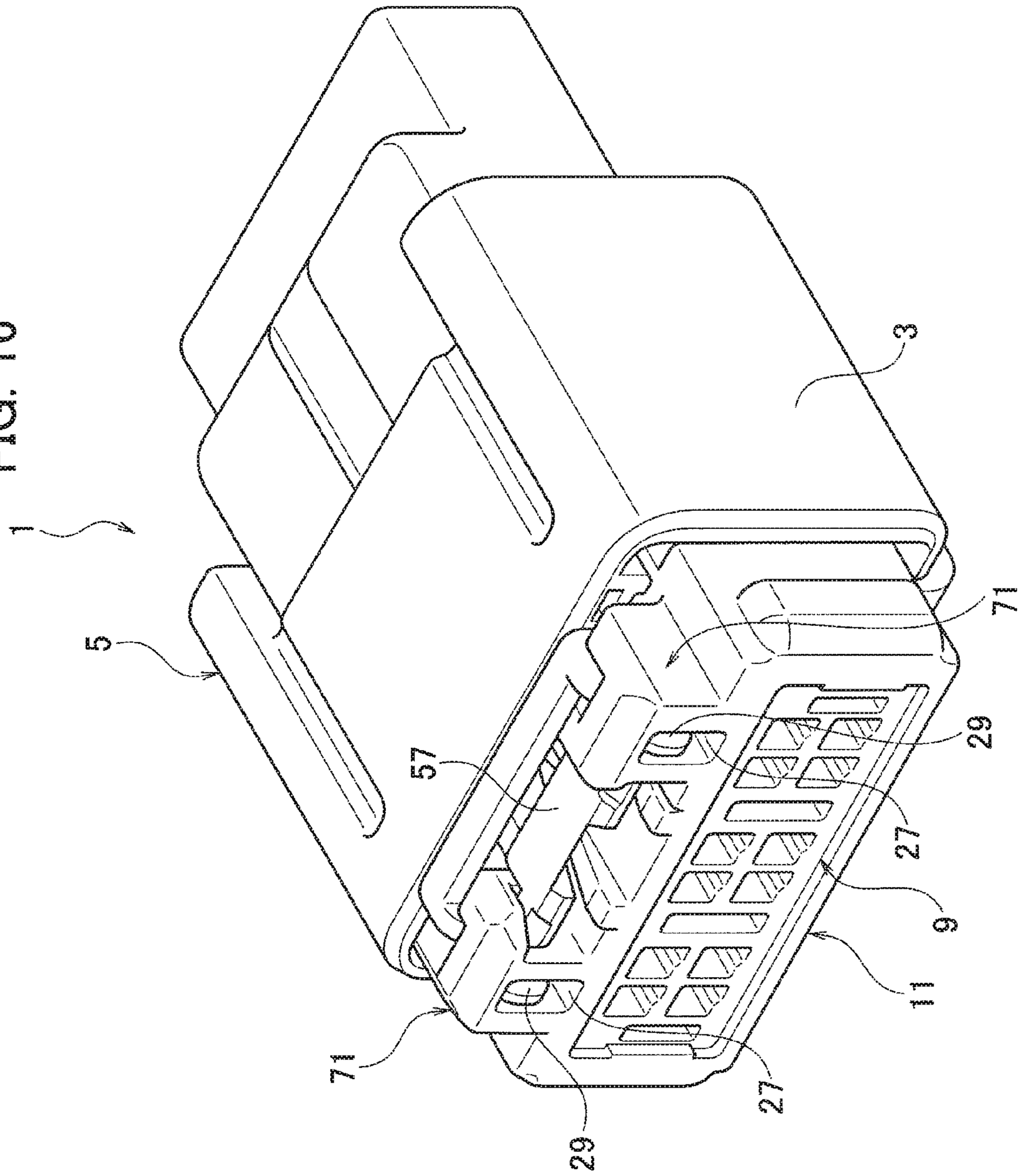
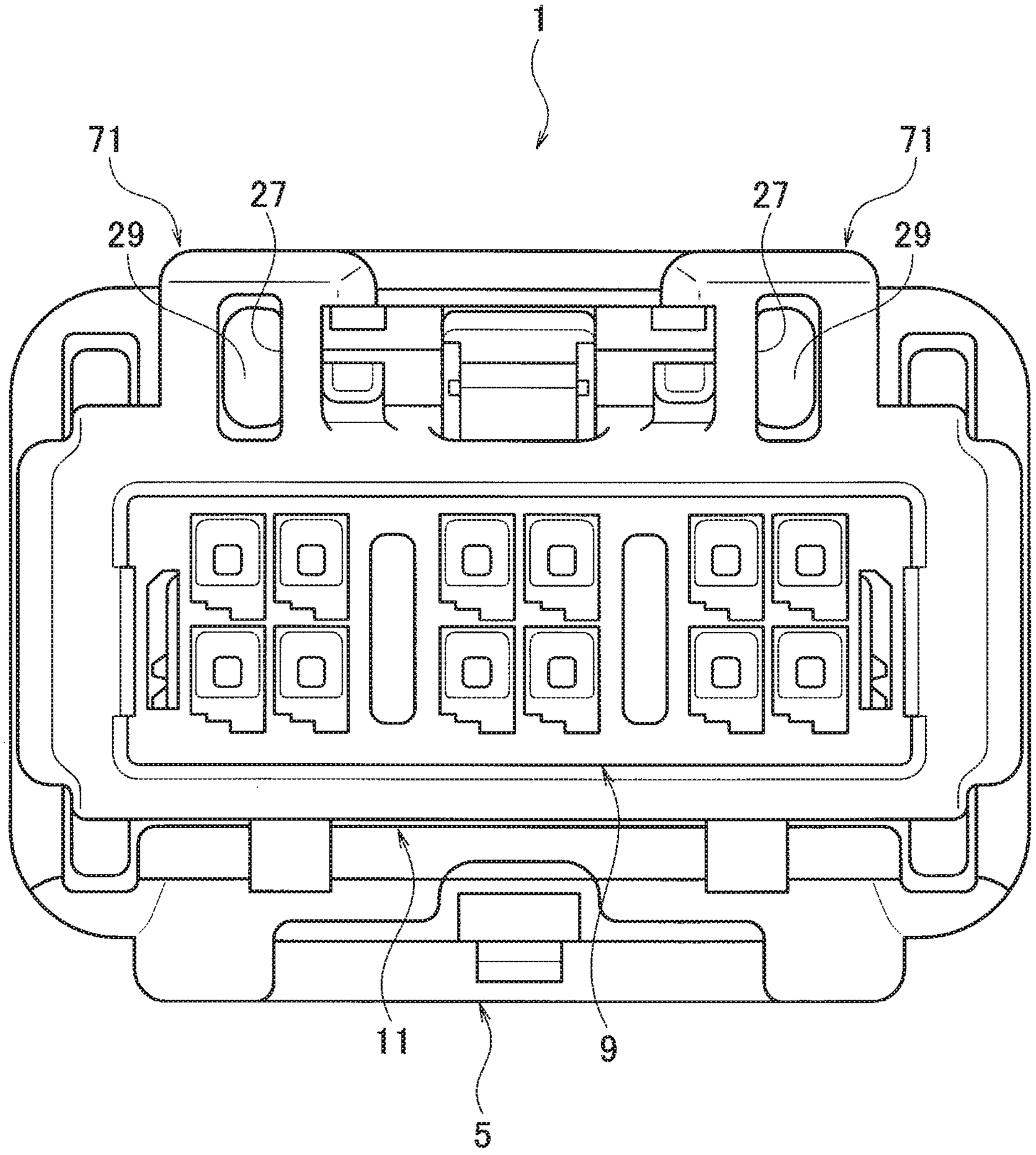


FIG. 17



CONNECTOR

CROSS REFERENCE TO RELATED APPLICATION

The present application is based on, and claims priority from Japanese Patent Application No. 2016-149195, filed Jul. 29, 2016, the disclosure of which is hereby incorporated by reference herein in its entirety.

TECHNICAL FIELD

The present application relates to a connector, and more particularly to a connector having a first housing and a second housing that can be fitted to each other and a fitting detection member for detecting the fitting state between the first housing and the second housing.

BACKGROUND ART

As a connector in the conventional example, there is known a connector that includes a male connector housing as a first housing having a first fitting part, a female connector housing as a second housing having a second fitting part which is fittable to the first fitting part, and a fitting detection member assembled to the outer circumference of the female connector housing so as to be movable between a temporary locking position and a primary locking position (see US 2007/0105420 A1).

In the conventional connector, the fitting detection member is provided with a locking claw as a locking part which is locked to a connecting part as a locked part of the female connector housing to hold the fitting detection member at the temporary locking position and the primary locking position to the female connector housing and which is abuttable on the male connector housing.

In the conventional connector, with the male connector housing fitted to the female connector housing, the primary locking position of the locking claw to the connecting part is shifted by the male connector housing, so that the fitting detection member becomes possible to move from the temporary locking position to the primary locking position with the female connector housing.

It is possible to detect whether the male connector housing and the female connector housing are brought into a half-fitting state or a fitting state, depending on whether the fitting detection member is movable or immovable.

SUMMARY

In the conventional connector, when the first housing and the second housing are fitted to each other, the first fitting part of the first housing is accommodated in the second fitting part of the second housing, while the fitting detection member is positioned on the outer circumference of the second housing.

The fitting detection member positioned on the outermost side is provided with the locking part for holding the fitting detection member at the temporary locking position and the primary locking position to the second housing.

For this reason, the locking part is easily subjected to an external force due to its interference with peripheral members or the like. Thus, the primary locking position of the fitting detection member to the second housing may change irrespective of the fitted state of the first housing and the second housing, thereby raising the possibility that the fitting state cannot be detected accurately.

It is an object of the present application to provide a connector which is capable of suppressing influence of a fitting detection member on a locking part and which allows detection of fitting state with the fitting detection member to be accomplished stably.

A connector according to an aspect of the present application includes: a first housing having a first fitting part; a second housing having a second fitting part configured so as to be fittable to the first fitting part; a fitting detection member assembled to an outer circumference of the second housing so as to be movable between a temporary locking position and a primary locking position; an engaged part provided on the second fitting part; and an engaging part provided on the fitting detection member so as to be abuttable on the first fitting part, the engaging part being engaged to the engaged part to hold the fitting detection member at the temporary locking position and the primary locking position to the second housing. The second fitting part and the engaging part are accommodated in the first fitting part.

Since the second fitting part and the engaging part are accommodated in the first fitting part, the engaging part for holding the fitting detection member at the temporary locking position and the primary locking position to the second housing is not exposed to the outside, so that it is possible to prevent the engaging part from being subjected to an external force due to its interference with peripheral members or the like.

Therefore, in such a connector, it is possible to suppress the influence of the fitting detection member on the engaging part, thereby allowing the detection of the fitting state with the fitting detection member to be performed stably.

In a modification, the second fitting part may be provided with a contracted part which is formed lower than an outer circumferential surface of the second fitting part; the fitting detection member may be provided with a detective fitting part which is arranged in the contracted part and fittable to an interior side of the first fitting part; and an outer circumferential surface of the second fitting part and the outer circumferential surface of the detective fitting part may be formed flush with each other.

Since the outer circumferential surface of the second fitting part and the outer circumferential surface of the detective fitting part are formed flush with each other, the interior of the first fitting part can be miniaturized by reducing the swelling of the outer circumferential surfaces of the second fitting part accommodated in the first fitting part and the detective fitting part, thereby allowing the overall size of the connector to be miniaturized.

Additionally, the fitting detection member may be assembled to the second housing so as to be movable in a same direction as a fitting direction of the first housing and the second housing; the second fitting part and the detective fitting part may be provided, on their respective opposite surfaces in a moving direction of the fitting detection member, with an engagement projection extending in the moving direction and an engagement hole which is engageable with the engagement projection, respectively; and the engagement projection may have its tip side engaged with the engagement hole at the temporary locking position of the fitting detection member to the second housing.

Since the tip side of the engagement projection is engaged with the engagement hole at the temporary locking position of the fitting detection member to the second housing, it is possible to accomplish the movement of the engagement detection member from the temporary locking position to the primary locking position to the second housing stably.

Additionally, it is possible to insert the second housing into the first fitting part of the first housing smoothly.

Further, the detective fitting part may be formed into a substantial U-shape; and one of the engagement projection and the engagement hole, which is provided in the second fitting part, may be adapted so as to cover at least a part of the outer circumferential surface of the other one of the engagement projection and the engagement hole, which is provided in the detective fitting part.

As one of the engagement projection and the engagement hole, which is provided in the second fitting part covers at least a part of the outer circumferential surface of the other one of the engagement projection and the engagement hole, which is provided in the detective fitting part, it is possible to restrict the movement of the other one provided in the detective fitting part to the outside by the one provided in second fitting part positioned outside the detective fitting part, thereby preventing the U-shaped detective fitting portion from being opened.

Still further, at least one side of the fitting detection member may be formed into a substantial U-shape; and the connector is provided, between the second housing and a substantially U-shaped free end side of the fitting detection member, with opening preventive parts which are engaged in a substantially U-shaped opening direction of the fitting detection member.

Since the opening preventive parts engaged in a substantially U-shaped opening direction of the fitting detection member are provided between the second housing and the substantially U-shaped free end side of the fitting detection member, it is possible to prevent the fitting detection member from being opened, thereby allowing the fitting detection member to be held in the second housing stably.

Further, the fitting detection member may be provided with a confirmation hole penetrating in a movement direction of the fitting detection member to the second housing; and the second housing may be provided with a confirmation projection which is inserted into the confirmation hole at the primary locking position of the fitting detection member to the second housing.

Since the second housing is provided with the confirmation projection to be inserted into the confirmation hole at the primary locking position of the fitting detection member to the second housing, it is possible to detect the fitting state between the first housing and the second housing by visually confirming the presence/absence of the confirmation projection inserted into the confirmation hole.

With the connector according to the aspect of the present application, it is possible to suppress the influence of the fitting detection member on the engaging part and accomplish the detection of the fitting state with the fitting detection member stably.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a perspective view illustrating a condition that a fitting detection member is assembled to a second housing of a connector according to an embodiment.

FIG. **2** is a perspective view illustrating the condition that the fitting detection member is assembled to the second housing of the connector according to the embodiment as viewed from a direction different from FIG. **1**.

FIG. **3** is an exploded perspective view of a first housing of the connector according to the embodiment.

FIG. **4** is a cross-sectional view of the first housing of the connector according to the embodiment.

FIG. **5** is a perspective view of the second housing of the connector according to the embodiment.

FIG. **6** is a perspective view of the second housing of the connector according to the embodiment as viewed from a direction different from FIG. **5**.

FIG. **7** is a perspective view of the fitting detection member of the connector according to the embodiment.

FIG. **8** is an exploded perspective view illustrating a condition before assembling the fitting detection member to the second housing of the connector according to the embodiment.

FIG. **9** is a cross-sectional view illustrating the condition that the fitting detection member is assembled to the second housing of the connector according to the embodiment.

FIG. **10** is a cross-sectional view taken along a section different from that of FIG. **9**, illustrating the condition that the fitting detection member is assembled to the second housing of the connector according to the embodiment.

FIG. **11** is a cross-sectional view illustrating a condition that the first housing and the second housing of the connector according to the embodiment are fitted to each other and the fitting detection member is located at a temporary locking position.

FIG. **12** is a cross-sectional view illustrating a condition that the first housing and the second housing of the connector according to the embodiment are fitted to each other and when moving the fitting detection member from the temporary locking position to a primary locking position.

FIG. **13** is a cross-sectional view taken along a section different from that of FIG. **12**, illustrating the condition that the first housing and the second housing of the connector according to the embodiment are fitted to each other and when moving the fitting detection member from the temporary locking position to the primary locking position.

FIG. **14** is a cross-sectional view illustrating a condition that the first housing and the second housing of the connector according to the embodiment are fitted to each other and the fitting detection member is located at the primary locking position.

FIG. **15** is a cross-sectional view taken along a section different from that of FIG. **14**, illustrating the condition that the first housing and the second housing of the connector according to the embodiment are fitted to each other and the fitting detection member is located at the primary locking position.

FIG. **16** is a perspective view illustrating the condition that the fitting detection member of the connector according to the embodiment is located at the primary locking position.

FIG. **17** is a front view w illustrating the condition that the fitting detection member of the connector according to the embodiment is located at the primary locking position.

DESCRIPTION OF EMBODIMENTS

A connector according to an embodiment will be described with reference to FIGS. **1** to **17**.

The connector **1** according to the embodiment includes a first housing **5** having a first fitting part **3**, a second housing **9** having a second fitting part **7** configured to be fittable to the first fitting part **3**, and a fitting detection member **11** assembled to an outer circumference of the second housing **9** so as to be movable between a temporary locking position and a primary locking position.

The fitting detection member **11** is provided with an engaging part **15** which is locked to an engaged part **13** of the second fitting part **7** to hold the fitting detection member **11** at the temporary locking position and the primary locking

position to the second housing **9**. The engaging part **15** is arranged so as to be abuttable on the first fitting part **3**.

The second fitting part **7** and the engaging part **15** are accommodated in the first fitting part **3**.

The second fitting part **7** is provided with a contracted part **17** which is formed lower than an outer circumferential surface. The fitting detection member **11** is provided with a detective fitting part **19** which is arranged in the contracted part **17** and fittable to an interior side of the first fitting part **3**.

The outer circumferential surface of the second fitting part **7** and the outer circumferential surface of the detective fitting part **19** are formed flush with each other.

The fitting detection member **11** is assembled the second housing **9** so as to be movable in the same direction as the fitting direction of the first housing **5** and the second housing **9**.

On respective opposite surfaces of the detective fitting part **19** and the second fitting part **7** in the moving direction of the fitting detection member **11**, there are formed engagement projections **21** each extending in the moving direction and engagement holes **23** which are engageable with the engagement projections **21**.

The tip side of each of the engagement projections **21** is engaged with corresponding engagement hole **23** at the temporary locking position of the fitting detection member **11** to the second housing **9**.

The detective fitting part **19** is formed into a V-shape. Each of the engagement holes **23** of the second fitting part **7** is adapted so as to cover at least a part of an outer circumferential surface of corresponding engagement projection **21** of the detective fitting part **19**.

Between the second housing **9** and the U-shaped free end side of the fitting detection member **11**, there are provided opening preventive parts **25** which are engaged in a U-shaped opening direction of the fitting detection member **11**.

The fitting detection member **11** is provided with confirmation holes **27** penetrating in the movement direction to the second housing **9**. The second housing **9** is provided with confirmation projections **29** which are inserted into the confirmation holes **27** at the primary locking position of the fitting detection member **11** to the second housing **9**.

The first housing **5** is made of insulating material such as synthetic resin. The first housing **5** is provided with the first fitting part **3** which is opened to one side of the first housing **5** and in which the second fitting part **7** of the second housing **9** can be fitted.

The first fitting part **3** is provided, on its bottom side, with a plurality of first terminal accommodating chambers **33** for accommodating first terminals **31**.

The plurality of first terminal accommodating chambers **33** are opened on the other side of the first housing **5**. Inside each of the first terminal accommodating chambers **33**, there is bendably arranged a first locking lance **35** for locking corresponding first terminal **31**.

An opening is opened to the bottom surface of the first housing **5** and communicates with the plurality of first terminal accommodating chambers **33**. By inserting a first spacer **37** into the opening, the plurality of first terminals **31** are doubly locked in the first terminal accommodating chambers **33**.

The plurality of first terminals **31** are respectively accommodated in the plurality of first terminal accommodating chambers **33** through an opening formed on the other side of the first housing **5**.

Each of the first terminals **31** is composed of a male terminal having a tab-shaped connecting part. The first terminals **31** are electrically connected to terminal parts of a plurality of electric wires **39** which are connected to, for example, an air-bag circuit for controlling the operation of an air bag.

The plurality of first terminals **31** are connected to a plurality of second terminals **41** accommodated in the second housing **9** since the second fitting part **7** of the second housing **9** is fitted to the first fitting part **3** of the first housing **5**.

The second housing **9** is made of insulating material such as a synthetic resin. The second housing **9** is provided, on its one side, with the second fitting part **7** which is fittable in the first fitting part **3** of the first housing **5**, which has the opening formed to allow an insertion of the tab-shaped connecting parts of the first terminals **31**.

Inside the second fitting part **7**, there are provided a plurality of second terminal accommodating chambers **43** for accommodating the second terminals **41**.

The plurality of second terminal accommodating chambers **43** are opened on the other side of the second housing **9**. Inside each of the second terminal accommodating chambers **43**, there is bendably provided a second locking lance **45** for locking the second terminal **41**.

An opening is opened to the bottom surface of the second housing **9** and communicates with the plurality of second terminal accommodating chambers **43**. By inserting a second spacer **47** into the opening, the plurality of second terminals **41** are doubly locked in the second terminal accommodating chambers **43**.

The plurality of second terminals **41** are respectively accommodated in the plurality of second terminal accommodating chambers **43** through an opening formed on the other side of the second housing **9**.

Each of the second terminals **41** is composed of a female terminal having a box-shaped connecting part allowing an insertion of the tab-shaped connecting part of the first terminal **31**. The second terminals **41** are electrically connected to terminal parts of a plurality of electric wires **49** which are connected to, for example, a power supply an instrument, or the like.

The plurality of second terminals **41** are electrically connected to the plurality of first terminals **31** accommodated in the first housing **5** since the second fitting part **7** of the second housing **9** is fitted to the first fitting part **3** of the first housing **5**.

The fitting state of the first housing **5** and the second housing **9** is held by the engagement of a locking part **51** provided in the first housing **5** with a locked part **53** provided in the second housing **9**.

The locking part **51** is arranged at the opening edge of the first fitting part **3** of the first housing **5** to form a projection protruding toward the interior side of the first fitting part **3**.

The locked part **53** constitutes an opening provided in the vicinity of the central part of a lock arm **55** which is flexibly arranged on the upper surface of the second housing **9**.

During fitting between the first housing **5** and the second housing **9**, the locking part **51** abuts on the lock arm **55**, causing the lock arm **55** to be deflected downward. Then, when the first housing **5** and the second housing **9** are fitted to each other, the locking part **51** reaches the locked part **53**, and then the lock arm **55** restores upward. Thus the locking part **51** is locked to the locked part **53**.

With the engagement of the locking part **51** with the locked part **53**, the second fitting part **7** of the second housing **9** is prevented from slipping out of the first fitting

part **3** of the first housing **5**, so that the fitting state between the first housing **5** and the second housing **9** is maintained.

When releasing the fitting of the first housing **5** to the second housing **9**, an operating part **57** provided on the free-end side of the lock arm **55** is pushed downward. Consequently, the lock arm **55** is bent downward to release the engagement between the locking part **51** and the locked part **53**, thereby allowing the fitting state between the first housing **5** and the second housing **9** to be released.

On both sides of the operating part **57** of the lock arm **55**, a pair of protection walls **59** are formed so as to protrude from the upper surface of the second housing **9** and protect the operating part **57**.

By protecting the operating part **57** with the protection walls **59**, it is possible to prevent an interference between the operating part **57** and its peripheral members and therefore, misoperation of the operating part **57** due to the interference with the peripheral members can be prevented.

In the first housing **5**, there are accommodated short-circuit terminals **61** which are brought into contact with the plurality of first terminals **31** to electrically connect them with each other under condition that the first housing **5** and the second housing **9** are not fitted to each other.

By connecting the plurality of first terminals **31** with each other through the short-circuit terminals **61**, it is possible to prevent potential differences from being generated among the first terminals **31** due to static electricity under condition that the fitting state between the first housing **5** and the second housing **9** is released by e.g. maintenance or the like and therefore, an erroneous explosion of an air bag can be prevented.

The mutual connection among the first terminals **31** through the short-circuit terminals **61** is released since respective contact pieces of the short-circuit terminals **61** in contact with the first terminals **31** are displaced by a push-up part **63** of the second housing **9** when the first housing **5** and the second housing **9** are fitted to each other.

Such a fitting state of the first housing **5** and the second housing **9** can be detected by the position of the fitting detection member **11** assembled to the outer circumference of the second housing **9**.

The fitting detection member **11** is made of insulating material such as synthetic resin. The fitting detection member **11** is assembled to the outer circumference of the second housing **9** so as to be movable in the same direction as the fitting direction of the first housing **5** and the second housing **9**. The engaging part **15** is provided on one side of the fitting detection member **11**. The detective fitting part. **19** is provided on the other side of the fitting detection member **11**.

The engaging part **15** is provided on the free end side of a detection arm **65** bendably provided on one side of the fitting detection member **11**.

The engaging part **15** is engaged to the engaged part **13** constituting the locked part **53** provided on the lock aim **55** of the second housing **9**. The engaging part **15** is arranged so as to be abuttable on the locking part **51** of the first housing **5** when the first housing **5** and the second housing **9** are fitted to each other.

When the first housing **5** and the second housing **9** are not fitted to each other or when they are brought into in a half-fitting state, the engaging part **15** is engaged with the locked part **53** side of the engaged part **13** to restrict the movement of the fitting detection member **11** from the temporary locking position to the primary locking position, thereby holding the temporary locking position of the fitting detection member **11** to the second housing **9**.

If the first housing **5** and the second housing **9** are fitted to each other from the above state, the locking part **51** abuts on the engaging part **15**, so that the detection aim **65** is deflected downward and consequently, the engagement between the engaging part **15** and the engaged part **13** is released.

Under the condition that the engagement between the engaging part **15** and the engaged part **13** is released, the fitting detection member **11** can be moved from the temporary locking position to the primary locking position to the second housing **9** and therefore, it is possible to detect that the housing **5** and the second housing **9** have been fitted to each other.

Under the condition that the fitting detection member **11** is positioned at the primary locking position, the detection arm **65** is restored upward, so that the engaging part **15** is engaged with the engaged part **13** side opposite to the locked part **53** to hold the fitting detection member **11** at the primary locking position to the second housing **9**.

Depending on whether or not the position of the fitting detection member **11** to the second housing **9** is shifted from the temporary locking position to the primary locking position, it is possible to detect whether or not the first housing **5** and the second housing **9** have been fitted to each other, thereby allowing the fitting state of the first housing **5** and the second housing **9** to be detected.

The engaging part **15** for controlling the movement of the fitting detection member **11** to the second housing **9** is accommodated in the first fitting part **3** of the first housing **5**.

By accommodating the engaging part **15** in the first fitting part **3**, the first fitting part **3** is positioned outside the engaging part **15**. Thus, as there is no possibility that the engaging part **15** interferes with the peripheral members, it is possible to prevent the engaging part **15** from being subjected to an external force.

Therefore, it is possible to accurately control the movement of the fitting detection member **11** in accordance with the fitting state of the first housing **5** and the second housing **9**, thereby allowing the detection of the fitting state with the fitting detection member **11** to be accomplished stably.

The detective fitting part **19** is provided on the other side of the fitting detection member **11** and is formed into a U-shape with an opened upper surface. The detective fitting part **19** is disposed in the contracted part **17** which is formed to be lower than the outermost circumferential surface of the second fitting part **7** of the second housing **9**.

The detective fitting part **19** is movably arranged in the contracted part **17**. When the first housing **5** and the second housing **9** are fitted to each other, the detective fitting part **19** is fitted to the interior side of the first fitting part **3** of the first housing **5** and also accommodated in the first fitting part **3**.

The outer circumferential surface of the detective fitting part **19** is formed flush with the outermost circumferential surface of the second fitting part **7**.

By forming the outer circumferential surface of the detective fitting part **19** flush with the outer circumferential surface of the second fitting part **7**, the outer circumferential surface of the detective fitting part **19** does not protrude from the outer circumferential surface of the second fitting part **7**. As a result, it is possible to miniaturize the inside of the first fitting part **3** in which the detective fitting part **19** is accommodated, thereby allowing the connector **1** to be miniaturized.

The engagement projections **21** and the engagement holes **23** are provided on respective opposite surfaces of the

detective fitting part **19** and the second fitting part **7** in the moving direction of the fitting detection member **11**.

The engagement projections **21** are formed so as to extend from the surface of the detective fitting part **19**, which are opposed to the second fitting part **7**, toward the second fitting part **7** in the movement direction. There are the plurality of engagement projections **21** (four in the embodiment) in the circumferential direction of the detective fitting part **19**.

Each of the engagement projections **21** is formed with a T-shaped cross section so as to protrude toward the outside of the fitting detection member **11**. The T-shape is continuously formed over the moving direction of the fitting detection member **11**.

Each of the engagement holes **23** is formed so as to extend from the surface of the second fitting part **7**, which is opposed to the detective fitting part **19**, toward the second fitting part **7** in the movement direction. Corresponding to the engagement projections **21**, there are a plurality of engagement holes **23** (four in the embodiment) in the circumferential direction of the second fitting part **7**.

Each of the engagement holes **23** is covered a part of the outer circumferential surface of corresponding engagement projection **21**.

Under the condition that the fitting detection member **11** is assembled at the temporary engagement position to the second housing **9**, the engagement projections **21** and the engagement holes **23** are brought into a condition where the tip side of each of the engagement projections **21** is inserted into corresponding engagement hole **23**.

Here, assume that the engagement projections **21** and the engagement holes **23** are not provided or that the tip side of each of the engagement projections **21** is not inserted into corresponding engagement hole **23** at the temporary locking position of the fitting detection member **11**. In such a case, a perfect clearance without any abutment will be produced between the second fitting part **7** and the engagement projections **21** or between the second fitting part **7** and the detective fitting part **19**.

If the second housing **9** is attempted to be inserted into the first fitting part **3** of the first housing **5** under such a condition, the tip of each of the engagement projections **21** or the edge of the detective fitting part **19** may collide with the opening edge of the first fitting part **3**, thereby raising the possibility that the second housing **9** cannot be smoothly inserted into the first fitting part **3**.

From this perspective, by engaging the tip side of each of the engagement projections **21** with corresponding engagement hole **23** at the temporary engagement position of the fitting detection member **11**, it is possible to smoothly insert the second housing **9** into the first fitting part **3**.

With the engagement between the engagement projections **21** and the engagement holes **23**, it is possible to stably move the fitting detection member **11** from the temporary locking position to the primary locking position to the second housing **9**.

Since a part of the outer circumferential surface of each of the engagement projections **21** is covered by corresponding engagement hole **23**, it is possible to prevent the U-shaped detective fitting part **19** from being opened and also possible to prevent the fitting detection member **11** from being deformed.

As for the shapes of each of the engagement projections **21** and each of the engagement holes **23**, for example, each of the engagement projections **21** may be formed with a trapezoid projecting outward, provided that each of the engagement holes **23** is shaped as to cover the trapezoidal inclined surfaces of each of the engagement projections **21**.

In the embodiment, each of the engagement holes **23** is throughly formed in the wall part of the second fitting part **7**. However, the shape of each of the engagement holes **23** is not limited to this, and it may be formed in the form of a groove on the inner wall surface of the second fitting part **7**. In this case, it is possible to cover the entire area of the outer circumferential surface of each of the engagement projections **21** and also possible to prevent the detective fitting part **19** from being opened furthermore.

In order to prevent the detective fitting part **19** from being opened, the connector **1** is provided with the opening preventive parts **25**, in addition to the shapes of the engagement projections **21** and the engagement holes **23**.

Each of the opening preventive parts **25** includes an opening preventive groove **67** provided on the U-shaped free end side of the detective fitting part **19** and an opening preventive rib **69** provided in the second housing **9** to engage with the opening preventive groove **67**.

The opening preventive grooves **67** and the opening preventive ribs **69** are engaged with each other in the opening direction of the U-shaped detective fitting part **19** to prevent the detective fitting part **19** from being opened. Thus, this engagement between the opening preventive grooves **67** and the opening preventive ribs **69** allows the assembling state of the fitting detection member **11** to the second housing **9** to be stabilized by preventing a deformation of the fitting detection member **11**.

In order to confirm the primary locking position of the fitting detection member **11** that moves between the temporary locking position and the primary locking position, the confirmation holes **27** and the confirmation projections **29** are provided in the fitting detection member **11** and the second housing **9**, respectively.

The confirmation holes **27** are provided in the fitting detection member **11** and also provided on respective wall parts of a pair of frame parts **71**, **71** in the vicinity of a pair of protection walls **59**, **59** of the second housing **9**, the wall parts of each frame part **71** being opposed to each other in the movement direction of the fitting detection member **11**.

The confirmation holes **27** are formed so as to pierce the wall parts of the frame parts **71** in the movement direction of the fitting detection member **11** so that the interior side of the fitting detection member **11** can be visually recognized from the outside.

The confirmation projections **29** are provided in the pair of protection walls **59**, **59** of the second housing **9** respectively. Also, in order to allow an insertion into the confirmation holes **27**, each of the confirmation projections **29** is continuously formed so as to project from corresponding protection wall **59**, in the form of a single member extending toward the confirmation holes **27**.

When the fitting detection member **11** is positioned at the temporary locking position, the confirmation projections **29** are not inserted into the confirmation holes **27**. However, when the fitting detection member **11** is positioned at the primary locking position, the confirmation projections **29** are inserted into the confirmation holes **27**.

By visually confirming the presence or absence of an insertion of the confirmation projections **29** into the confirmation holes **27**, it is possible to detect the secure locking position of the fitting detection member **11** and also possible to detect the fitting state between the first housing **5** and the second housing **9** reliably.

In the fitting detection member **11**, the frame parts **71** are provided, on their upper surfaces, with lock holding parts **73** which are locked to both sides of the operating part **57** of the

lock arm **55** in the width direction to hold the lock arm **55** when the fitting detection member **11** is positioned at the primary locking position.

Each of the lock holding parts **73** is provided, on its front side in the movement direction, with an inclined surface which abuts on the operating part **57** of the lock arm **55** when moving the fitting detection member **11** to the primary locking position to deflect the lock arm **55** downward and which is locked to the operating part **57** by upward restoring of the lock aim **55** when the fitting detection member **11** is positioned at the primary locking position.

By holding the operating part **57** of the lock arm **55** through the lock holding parts **73**, it is possible to restrict the movement of the fitting detection member **11** from the primary locking position to the temporary locking position.

The operating part **57** of the locking arm **55** allows its engagement with the lock holding parts **73** to be released by pushing the operating part **57** downward with a predetermined pressing force, thereby allowing the fitting state between the first housing **5** and the second housing **9** to be cancelled.

Each of the frame part **71** of the fitting detection member **11** is arranged so as to cover the outer side surfaces of corresponding protection wall **59** and corresponding confirmation projection **29** in the width direction even if the fitting detection member **11** is in the temporary locking position.

In a case where each of the frame parts **71** of the fitting detection member **11** does not cover the outer surfaces of corresponding protection wall **59** and corresponding confirmation projection **29**, there is a possibility that electric wires of the peripheral members enter between the confirmation projection **29** and the wall part defining the confirmation hole **27**.

Such an entry of electric wires may cause the breakage of the lock arm **55** and the breakage of the fitting detection member **11**. Additionally, when the fitting detection member **11** moves to the primary locking position, the electric wires and the lock arm **55** may interfere with each other to make it impossible for the lock arm **55** to be restored upward, thereby causing the possibility that the lock holding parts **73** and the operating part **57** are not engaged with each other, so that the fitting detection member **11** cannot be moved to the primary locking position.

Therefore, by covering the outer side surfaces of the protection walls **59** and the confirmation projections **29** with the frame parts **71**, it is possible to prevent the electric wires from entering between each of the confirmation projections **29** and a wall part defining corresponding confirmation hole **27**. As a result, it is also possible to prevent the breakage of the lock arm **55** and the breakage of the fitting detection member **11** and engage the lock holding part **73** and the operating part **57** with each other, thereby allowing the fitting detection member **11** to be held at the primary locking position.

In the connector **1**, as the second fitting part **7** and the engaging part **15** are accommodated in the first fitting part **3**, the engaging part **15** for holding the fitting detection member **11** at the temporary locking position and the primary locking position to the second housing **9** is not exposed to the outside, so that it is possible to prevent the engaging part **15** from being subjected to an external force due to its interference with the peripheral members or the like.

Therefore, with the connector **1**, it is possible to suppress the influence of the fitting detection member **11** on the engaging part **15**, thereby allowing the detection of the fitting state with the fitting detection member **11** to be performed stably.

Since the outer circumferential surface of the second fitting part **7** and the outer circumferential surface of the detective fitting part **19** are formed flush with each other, the interior of the first fitting part **3** can be miniaturized by reducing the swelling of the outer circumferential surfaces of the second fitting part **7** accommodated in the first fitting part **3** and the detective fitting part **19**, thereby allowing the overall size of the connector **1** to be miniaturized.

As the tip side of each of the engagement projections **21** is engaged with corresponding engagement hole **23** at the temporary locking position of the fitting detection member **11** to the second housing **9**, it is possible to accomplish the movement of the engagement detection member **11** from the temporary locking position to the primary locking position to the second housing **9** stably.

It is also possible to insert the second housing **9** into the first fitting part **3** of the first housing **5** smoothly.

As each of the engagement holes **23** provided in the second fitting part **7** covers at least a part of the outer circumferential surface of corresponding engagement projection **21** provided in the detective fitting part **19**, the movement of the engagement projections **21** of the detective fitting part **19** to the outside can be restricted by the engagement holes **23** of the second fitting part **7** positioned outside the detective fitting part **19**, thereby preventing the U-shaped detective fitting part **19** from being opened.

As the opening preventive parts **25** engaged in a substantially U-shaped opening direction of the fitting detection member **11** are provided between the second housing **9** and the U-shaped free end side of the fitting detection member **11**, it is possible to prevent the fitting detection member **11** from being opened, thereby allowing the fitting detection member **11** to be held in the second housing **9** stably.

As the second housing **9** is provided, with the confirmation projections **29** to be inserted into the confirmation holes **27** at the primary locking position of the fitting detection member **11** to the second housing **9**, it is possible to detect the fitting state between the first housing **5** and the second housing **9** by visually confirming the presence or absence of the confirmation projections **29** inserted into the confirmation holes **27**.

Although the connector **1** according to the embodiment has the engagement projections **21** provided in the detective fitting part **19** and the engagement holes **23** provided in the second fitting part **7**, the engagement projections **21** may be provided in the second fitting part **7**, provided that the engagement holes **23** are provided in the detective fitting part **19**.

By covering at least a part of the outer circumferential surface of each of the engagement holes **23** provided in the detective fitting part **19** with corresponding engagement projection **21** provided in the second fitting part **7**, it is possible to prevent the U-shaped detective fitting part **19** from being opened.

Alternatively, both the engagement projections **21** and the engagement holes **23** may be provided in the second fitting part **7** and the detective fitting part **19** by providing the engagement projections **21** and the engagement holes **23** alternately in the circumferential direction of the second fitting part **7** and the detective fitting part **19**.

What is claimed is:

1. A connector, comprising:

a first housing having a first fitting part;

a second housing having a second fitting part configured so as to be fittable to the first fitting part;

a fitting detection member assembled to an outer circumference of the second housing so as to be movable between a temporary locking position and a primary locking position;

an engaged part provided on the second fitting part; and

an engaging part provided on the fitting detection member so as to be abuttable on the first fitting part, the engaging part being engaged to the engaged part to hold the fitting detection member at the temporary locking position and the primary locking position to the second housing, wherein

the second fitting part and the engaging part are accommodated in the first fitting part.

2. The connector of claim **1**, wherein:

at least one side of the fitting detection member is formed into a substantial U-shape; and

the connector is provided, between the second housing and a substantially U-shaped free end side of the fitting detection member, with opening preventive parts which are engaged in a substantially U-shaped opening direction of the fitting detection member.

3. The connector of claim **1**, wherein:

the fitting detection member is provided with a confirmation hole penetrating in a movement direction of the fitting detection member to the second housing; and

the second housing is provided with a confirmation projection which is inserted into the confirmation hole at the primary locking position of the fitting detection member to the second housing.

4. The connector of claim **1**, wherein:

the second fitting part is provided with a contracted part which is formed lower than an outer circumferential surface of the second fitting part;

the fitting detection member is provided with a detective fitting part which is arranged in the contracted part and fittable to an interior side of the first fitting part; and

the outer circumferential surface of the second fitting part and an outer circumferential surface of the detective fitting part are formed flush with each other.

5. The connector of claim **4**, wherein:

the fitting detection member is assembled to the second housing so as to be movable in a same direction as a fitting direction of the first housing and the second housing;

the second fitting part and the detective fitting part are provided, on their respective opposite surfaces in a moving direction of the fitting detection member, with an engagement projection extending in the moving direction and an engagement hole which is engageable with the engagement projection, respectively; and

the engagement projection has its tip side engaged with the engagement hole at the temporary locking position of the fitting detection member to the second housing.

6. The connector of claim **5**, wherein:

the detective fitting part is formed into a substantial U-shape; and

one of the engagement projection and the engagement hole, which is provided in the second fitting part, is adapted so as to cover at least a part of an outer circumferential surface of the other one of the engagement projection and the engagement hole, which is provided in the detective fitting part.

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